5.0 USING EMISSIONS FACTORS FOR PURPOSED OTHER THAN EMISSIONS INVENTORIES

5.1 Introduction

AP-42 was originally designed to enable the development of area-wide air emissions inventories. Since its original publication in 1972, it has grown from a limited number of source categories and a small number of pollutants to a resource containing over 200 major source categories that include criteria and toxic air pollutant emissions factors. The current AP-42 is the most complete referenced source of air emissions factors within the United States.

AP-42 has been used as a cost-effective means of estimating emissions for other applications such as permitting, fee assessment, emissions trading, rule applicability determinations, and compliance analysis. Because AP-42 emissions factors were developed to represent the industry average, using them for precise calculations at a specific facility may result in a misrepresentation of actual emissions. Even with the potential for error in emissions estimation, the use of emissions factors has become widely accepted by federal, state, local, and tribal agencies as well as industry as a reproducible and cost-effective method for emissions estimation. Some of the current uses may be reasonable whereas others may result in a poor representation of actual emissions. This memorandum will identify the uses of emissions factors and the appropriateness of the use. In addition, options are provided for improving the uses of the emissions factors in the future.

5.2 Uses of Existing Emissions Factors

5.2.1 General Uses of Emissions Factors

As stated in the AP-42 introduction, "Emissions factors in AP-42 are neither EPA-recommended emission limits (e.g., best available control technologies or BACT, or lowest achievable emission rate or LAER) nor standards (e.g., National Emission Standard for Hazardous Air Pollutants or NESHAP, or New Source Performance Standard or NSPS). Use of these factors as source-specific permit limits and/or as emission regulation compliance determinations is not recommended by EPA." In spite of these warnings regarding the limitations on the uses of emissions factors, the application of emissions factors has expanded through the years. Uses of emissions factors that would not have been conceivable a few years ago are now commonplace. MACTEC believes that for many air emission applications where emission estimates are needed, people are using AP-42 factors to estimate those emissions. Some of the applications are a valid use of the emissions factors while other applications may not be. Table 5.1 includes a comprehensive list of existing emissions factor uses and the advantages/disadvantages of the particular application.

TABLE 5.1 EMISSIONS FACTOR USES

Application	Comment
Emissions Inventories	
National Emissions Inventory Guidance. AP-42 emissions factors are recommended for estimating emissions at the national level.	This was the original use for which the AP-42 emissions factors were developed.
State Emissions Inventory Guidance. All 50 states reference AP-42 as a source of emissions factors for use in a variety of emissions calculations, including the estimation of emissions at the facility level.	State guidance documents typically do not mention the inherent limitation associated with AP-42 emissions factors. When used in national or State level inventories at the beginning of the SIP development process, the intent is to generate a reasonablely unbiased estimate of actual emissions that replicate the conditions that were the cause of the non attainment situation. For areas where there are many sources that are part of the inventory, it is likely that the biases of one source category would be canceled by the opposite biases in other source categories and the variabilities inherent in individual facilities emissions would be reduced in magnitude as a result of merging the data. However, where there exists a single or several sources that comprise a significant portion of the area's emissions, the potential bias of the emissions factor and the variabilities within the source category may create a significant bias in the aggregated emissions inventory.
Enforcement	
Estimation of Excess Emissions. AP-42 emissions factors are often used to quantify excess emissions that resulted from a permit violation (e.g., violation of fuel usage restriction).	Because AP-42 emissions factors are industry averages, actual emissions from specific sources may not be accurately estimated using emissions factors. In some cases, estimated emissions will be higher than actual emissions, in other cases estimated emissions will be lower than actual emissions, and in some cases estimated emissions will be equal to actual emissions.
Consent Decree Emission Reduction Estimates. AP-42 emissions factors are often used to quantify the emissions reduction that will result from implementing a consent decree. For example: • EPA: Chevron Refinery Consent Decree • EPA - Consent Decree: Cenex Refinery Settlement • EPA - Consent Decree: Archer Daniels Midland Company (ADM) Clean Air Act Settlement	

TABLE 5.1 – continued

Application	Comment
Compliance	
EPA Compliance Guides. Some of EPA's compliance guides recommend that AP-42 emissions factors be used as the preferred method for determining a source's compliance with a regulatory or permit requirement. Stack tests and material balance calculations may be listed as secondary methods for determining compliance. An example is the *Multimedia Environmental Compliance Guide for Food Processors.*	For specific sources, stack tests and material balance methods are likely to generate more accurate emissions estimates than AP-42 emissions factors. If emissions factors provide estimated emissions that are to low for a given facility, the facility may demonstrate compliance using the emissions factor estimate; however, the source to be out of compliance. If the use of an emissions factor that estimates emissions higher than actual emissions and indicates the facility is out of compliance, the facility may actually be in compliance and that could be verified by source testing.
Compliance Demonstrations. AP-42 emissions factors are often used to demonstrate compliance with both regulatory and permit restrictions.	
Permitting	
Regulatory Applicability Determinations. AP-42 emissions factors are often used to determine whether a regulation is applicable to a specific facility.	AP-42 emissions factors represent an average range of emissions rates and are not precise enough for regulatory applicability determination. If a facility is required to test, it has only about a 50% chance of being in compliance.
Emissions Trading or Banking. EPA allows low mass emission units to use emissions factors for trading in the acid rain program (see 40 CFR 75.19).	Compliance, reporting, and enforcement needs may differ from banking or selling credit needs.
Emissions Trading or Banking at State Level.	Tennessee is proposing to allow small sources that are not automatically covered under their NO_x budget program SIP to op-in. Since most of these sources do not use CEMS data, these sources are allowed to use AP-42 factors to calculate emissions with a 10% discount applied.
Modeling of Criteria and Hazardous Air Pollutants. AP-42 emissions factors are used as a basis for air emission modeling.	AP-42 factors are not designed for short-term emissions estimation. Their use on a specific source may compromise the accuracy of the output, resulting in possible over prediction or under prediction of ground level concentrations.
New Source Review	
PSD Netting. AP-42 emissions factors are used for facility netting over a seven to ten year time frame.	AP-42 emissions factors introduce variability into the netting calculation.

TABLE 5.1 – continued

Application	Comment
NSR Workshop Manual (Draft 1990) Any time emission calculations are discussed in the guidance manual, AP-42 is used as one of the calculation approaches.	Use of AP-42 emissions factors is the first emissions estimation method recommended in the guidance. Since the process has not been constructed, actual test data are not available. Using emissions factors for netting or offsets could allow projects to proceed that should have been subject to the full analysis. Conversely, since AP-42 emissions factors may become outdated by new technology, using emissions factors may over predict the new source's emissions.
Plant Wide Applicability Limitations (PALs) or flexible permitting on pilot projects allows use of emissions factors as adjusted for uncertainty or limitations in factor development. Significant emissions units have to develop site specific emissions factors within six months (see 51.165(f)(12).	AP-42 emissions factors represent an average range of emission rates and are not precise enough for PALs. No directions are provided on how to perform an 'adjustment.' There are also no directions on how to accommodate differences in the uncertainties associated with applying an emissions factor to many small sources verses a single large source.
Best Available Control Technology (BACT) Analysis Factors that have an associated control technology do not necessarily reflect the best available or state of the art controls, but rather reflect the level of (typical) emissions when the section was published	Since a BACT analysis must be completed prior to initiation of construction, a stack test of the source is not possible. All emissions estimates must be from similar sources equipped with similar control equipment and operating at similar process/control equipment parameter rates. Control equipment efficiency varies with many parameters. The control efficiency should come from, and be guaranteed by the equipment vendor.
Best Available Retrofit Technology (BART)	The BART program requires the potential to emit to be calculate from the affected sources although no emissions factor calculation methods are specified.
PSD Appeals. AP-42 emissions factors have been used as part of the appeal process. A specific example is the Hawaiian Commercial & Sugar Company who referenced AP-42 in the technical portion of their appeal.	AP-42 was used to compare the differences in emissions from various types of fuels.
Toxic Air Pollutants	
Demonstrate Compliance. AP-42 is used to demonstrate compliance with state air toxic emissions and NESHAP requirements.	AP-42 emissions factors have even more limited information on toxics than on the criteria pollutants. The preferred approach is to use AP-42 only as a guide to identify the pollutants that are expected from the source.

TABLE 5.1 – continued

Application	Comment
Air Toxics Modeling - Compliance with fence line concentrations that are established by the state.	Using AP-42 emissions factors compromises the accuracy of a model's output. The information on toxics is limited and there is no consideration of the difference in emission rates for short term, unsteady state operations and long term, average operations. The proper emission rate input data for short term modeling is usually considerably higher than the average emission rate. For long term modeling, the average emission rate which has no stated bias and variability will perhaps give valid results if there are sufficient sources being modeled; but for a single source, the average emission rate will overestimate risks for about half of the facilities and underestimate risks for the other facilities.
Models and Computer Databases	
FIRE. EPA database that contains emissions factors for a variety of sources.	FIRE includes AP-42 emissions factors with only limited additional information. The FIRE data base includes not only rated emissions factors that are supported by AP-42 sections and background reports, but also contains extrapolated emissions factors that came from the old AIRS data base, factors incorporated following the NAPAP inventory, and factors from EIIP documents.
EDMS. This model, which was jointly developed by the Federal Aviation Administration (FAA) and the United States Air Force (USAF), produces an emissions inventory of all airport sources and calculates concentrations produced by these sources at specified receptors.	AP-42 emissions factors are integrated into the model which provides a screening tool for conformity rule applicability.
Landfill Gas Model Version 2	AP-42 emissions factors are the second choice of default values build into the model.
TANKS	AP-42 emissions factors are integrated into the model.
Water 9	
Other	
Facts Sheets	AP-42 emissions factors are used to provide information in various guidance documents.
Army Headquarters. AP-42 emissions factors are used by the Army for outreach tools, analysis for sustainable ammo, army training support practices, testing practices, fate studies, and transport studies.	The other branches of the armed services are likely to use AP-42 emissions factors for similar applications.

TABLE 5.1 – concluded

Application	Comment
TRI-EPCRA	AP-42 emissions factors are used to comply with the SARA 313 requirements.
Health Risk Assessments	AP-42 emissions factors are recommended as the starting point in the guidance. A model that attributes health effects to a single facility based upon the application of an emissions factor with an unstated bias and variability will underestimate risks from about half of the facilities and overestimate risks for the other half of the facilities.
Heath Hazard Assessments	

5.2.2 Emissions Factors in Regulatory Applications

Even with the known limitations, EPA has used AP-42 as a resource when developing regulations. The Code of Federal Regulations cites AP-42 in eight different parts within Title 40. Following the requirements in the regulations, users are directed to use the factors for purposes which they were not originally intended or developed. The citations in the regulations do not explain the limitations of the uses of emissions factors. The eight parts and the associated subparts where AP-42 is referenced are identified in Table 5.2. Table 5.2 also presents brief descriptions of the guidance within each citation.

TABLE 5.2 REFERENCES TO AP-42 IN 40 CFR

Part	Subsection	Description of Regulatory Guidance
Part 51 – Requirements for Preparation, Adoption, and Submittal of Implementation Plans	**Appendix W** – Guideline on Air Quality Models	Recommends using AP-42 emissions factors as a source for emissions data.
	Subpart W – Determining Conformity of General Federal Actions to State or Federal Implementation Plans	The rule requirements state "AP-42 must be used for the conformity analysis unless more accurate emission data are available."
	Appendix A – Summaries of Preferred Air Quality Models	EDMS, which uses algorithms consistent with AP-42, is recommended for regulators to use as a basis for air dispersion modeling.
Part 52 – Approval and Promulgation of Implementation Plans	**Subpart D** – Arizona	AP-42 emissions factors are referenced to determine emissions for alternate methods for silt loading.
	Subpart O – Illinois	Tanks section of the rule references AP-42 to determine the molecular weight of vapor in each storage tank.

TABLE 5.2 – concluded

Part	Subsection	Description of Regulatory Guidance
Part 60 – Standards of Performance for New Stationary Sources	**Subpart A** – General Provisions 60.14(b)(1)	When demonstrating if the emission rate will significantly increase, this section encourages the use of AP-42 unless superior emissions factors exist.
	Subpart WWW – Standards of Performance for Municipal Solid Waste Landfills	All tests must use AP-42 as a guide for identifying all compounds in the sample that must be tested. Also the constants K and Lo (kinetic values) must be obtained from AP-42 to demonstrate compliance. [Note: Although AP-42 incorporates the Lo and K for regulatory purposes, these values were assigned by the Agency for regulatory purposes and provide a conservatively high methane generation rate.]
Part 61 – National Emission Standards for Hazardous Air Pollutants	**Subpart A** – General Provisions	This section mirrors the wording in Part 60, Subpart A
Part 63 – National Emission Standards for Hazardous Air Pollutants for Source Categories	**Subpart WW** – Storage Vessels - Control Level 2	AP-42 emissions factors are the basis for using an alternate control device or combination of control devices on a tank.
	Subpart WWWW – Reinforced Plastic Composites Production	Recommends AP-42 as the approach for calculating HAP emissions from a new facility to determine rule applicability
Part 69 – Special Exemptions from Requirements of the Clean Air Act	**Subpart A** – Guam	AP-42 is listed in definitions only.
Part 72 – Permits Regulation	**Subpart D** – Acid Rain Compliance Plan and Compliance Options	Subpart D states "A demonstration under paragraph I(5)(iii) of 72.41, Phase I substitution plans, shall include supporting documentation from AP-42".
	Appendix C – Acid Rain Permit Applications	AP-42 emissions factors are the basis for calculating SO_2 emissions from coal.
Part 93 – Determining Conformity of Federal Actions to State or Federal Implementation Plans	**Subpart B** – Determining Conformity of General Federal Actions to State or Federal	The rule requirements state, "AP-42 must be used for the conformity analysis unless more accurate emission data are available"

In addition to the reference of AP-42 in 40 CFR, there are eight parts wherein emissions factors are referenced. Within each of the parts, the emissions factor's references vary from requiring the creation of an emissions factor to documenting the source of an existing emissions factor. Table 5.3 includes the parts, subparts, and a brief description of the regulatory guidance.

TABLE 5.3 REFERENCES TO EMISSIONS FACTORS IN 40 CFR

Part	Subsection	Description of Regulatory Guidance
Part 51 – Requirements for Preparation, Adoption, and Submittal of Implementation Plans	**Subpart A** – Emissions Inventory Reporting Requirements	Anytime an emissions factor is used to calculate emissions for the inventory it must be documented.
	Subpart G – Control Strategy	When complying with the emissions reporting requirements for SIP revisions relating to budgets for NO_x emissions it states that the emissions factor and its source need to be included in the documentation.
	Subpart I – Review of New Sources and Modifications	Emissions factors are one of the options that can be used to show compliance. Other options include material balances, CEMS, CPMS, or PEMS. If emissions factors are used to comply with PALs, additional requirements for the emissions estimates are included in the regulation.
	Subpart P – Protection of Visibility	*Reporting of Emissions for the Mohave Generating Station for the Years 2003 through 2006.* For the years 2003, 2004, 2005, and for any part of the year 2006 before installation and operation of sulfur dioxide controls at the Mohave Generating Station, emissions from the Mohave Generating Station will be calculated using a sulfur dioxide emissions factor of 0.15 pounds per million BTU.
	Subpart S – Inspection/Maintenance Program Requirements	Emissions factors are used as part of the MOBILE6 model.
Part 52 – Approval and Promulgation of Implementation Plans	**Subpart A** – General Provisions	Emissions factors are one of the options that can be used to show compliance. Other options include material balances, CEMS, CPMS or PEMS. If emissions factors are used to comply with PALs, additional requirements for the emissions estimates are included in the regulation.
	Subpart YY – Wisconsin	Use of model MOBIL6 to recalculate Motor Vehicle Emissions Budgets for Sheboygan County. MOBILE6 is based on AP-42 emissions factors.

TABLE 5.3 - concluded

Part	Subsection	Description of Regulatory Guidance
Part 60 – Standards of Performance for New Stationary Sources	**Appendix D** – Required Emissions Inventory Information	Emissions factors are one of the options for estimating emissions to demonstrate compliance. Other options listed in the regulation include stack testing and material balances.
Part 61 – National Emission Standards for Hazardous Air Pollutants	**Subpart N** – Inorganic Arsenic Emissions from Glass Manufacturing	An emissions factor must be derived as defined in the regulation to demonstrate compliance. The use of existing emissions factors like AP-42 is not an option in this regulation
Part 63 – National Emission Standards for Hazardous Air Pollutants for Source Categories	**Subpart PPP** – Polyether Polyols Production	An emissions factor must be derived as defined in the regulation to demonstrate compliance. The use of existing emissions factors like AP-42 is not an option in this regulation
Part 74 – Sulfur Dioxide Opt-Ins	**Subpart C** – Allowance Calculations for Combustion Sources	The SO_2 emission rate is calculated using an emissions factor for each type of fuel consumed during the specified year.
Part 75 – Continuous Emission Monitoring	**Subpart B** – Monitoring Provisions	The regulation includes several tables with emissions factors. The factors are not referenced so the source or method used to calculate the factors is unknown.
	Subpart F – Recordkeeping Requirements	If emissions factors are used as part of the monitoring provisions, the basis for the factor must be documented.
Part 86 – Control of Emission from New and in-Use Highway Vehicles and Engines	**Subpart R** – General Provision for the Voluntary National Low Emission Vehicle Program for Light -Duty Trucks	Emissions factors are used as part of the Mobile6 model.

In addition to the EPA references to emissions factors appearing in the CFR, 32 states have followed the EPA's lead and included AP-42 references in their state regulations. The majority of the state references mirror the citations in 40 CFR. Emissions factor uses vary from state to state. Some of the main areas in the state regulations where AP-42 is cited include definitions, air controls, emissions banking, open burning, conformity analysis, tanks, landfills, non attainment, NSR, permitting, stationary sources, and individual pollutants. The states that reference AP-42 within their regulations include:

Alabama	Massachusetts	Oregon
Alaska	Minnesota	Puerto Rico
Arizona	Missouri	Tennessee
Colorado	Nebraska	Texas
Connecticut	Nevada	Vermont
Delaware	New Hampshire	Virginia
Florida	New Jersey	West Virginia
Illinois	New Mexico	Wisconsin
Indiana	New York	Wyoming
Kansas	North Dakota	
Louisiana	Ohio	
Maine	Oklahoma	

5.3 Using Emissions Factors in the Future

Based upon the preceding discussion, it is apparent that AP-42 emissions factors are currently being used for purposes for which they were not intended. As described in Table 5.1, there are numerous negative consequences associated with the misuse of the emissions factors. Alternatives to using AP-42 emissions factors to calculate emissions include conservative mass balances, ongoing performance testing, continuous emission monitoring, etc. However, at this time, it appears unreasonable to assume that the use of AP-42 emissions factors for purposes other than area wide emissions inventories will be discontinued. Therefore, MACTEC has developed several options for consideration regarding the future use of AP-42 emissions factors for various applications that would, hopefully, address the negative consequences identified in Table 5.1. Three options that have been developed are described below.

The three options are intended to be a starting point for discussing modifications regarding the uses of AP-42 emissions factors. These options will be reviewed with federal, state, local, and tribal agencies, as well as with industry to establish a consensus for improving how emissions factors are used. It is understood that the incorporation of input from such end users is critical because EPA must depend on the users to implement any changes developed as a result of this task.

5.3.1 Option 1: Define Use of Emissions Factors Based Upon Existing Rating System

Under Option 1, it has been assumed that the existing emissions factor rating system and AP-42 emissions factors would not be modified. Guidance regarding the use of emissions factors would be developed based upon the rating associated with each emissions factor. Cut points would be defined below which an emissions factor would not be recommended for use in a particular application. For example, it could be recommended that only emissions factors with ratings of B or better be used to establish permit limitations. If an emissions factor rating was insufficient for use in a given application, the guidance would suggest that alternate means (e.g., conducting a source test) be employed to better quantify the emissions.

For each of the existing AP-42 emissions factor applications identified in Table 5.1, a proposed emissions factor rating cut point has been developed; this information is presented in Table 5.4. It should be noted that the emissions factor ratings are subjective in nature and the establishment of cut points for their use is even more subjective. The values presented in Table 5.4 should be viewed as preliminary estimates only and would require extensive review by EPA; state, local, and tribal agencies; and industry prior to adoption.

TABLE 5.4 FUTURE USES OF EMISSIONS FACTORS

Application of Emissions Factor	Option 1	Option 2 /Option 3
	Minimum Rating	Range
Emissions Inventories		
National Emissions Inventory Guidance	E	Average
State Emissions Inventory Guidance	E	Average
Enforcement		
Estimation of Excess Emissions	B	Maximum
Consent Decree Emission Reduction Estimates.	B	Minium
Compliance		
EPA Compliance Guides	E	Average
Compliance Demonstration	B	Maximum
Permitting		
Regulatory Applicability Determinations	B	Maximum
Emission Trading or Banking	B	**Maximum** - for reporting, recordkeeping, compliance, and enforcement **Minimum** - for banking and selling
Modeling of criteria and Toxics	B	Maximum
New Source Review		
PSD Netting	B	Shutdown units - Minimum New units - Maximum
Plant wide Applicability Limitations (PALs)	B	Maximum
BACT	A	Maximum
Toxic Air Pollutants		
Demonstrate compliance on toxic air pollutants	C	Maximum
Air Toxic Modeling	B	Maximum

TABLE 5.4 - concluded

Application of Emissions Factor	Option 1	Option 2 /Option 3
	Minimum Rating	Range
Other		
Models and Computer Databases	E	Average
TRI- EPCRA	C	Maximum
Heath Hazard Assessments/Health Risk Assessments	C	Maximum

The advantages to implementing Option 1 are that it is very simplistic and could be implemented regardless of whether the options described in Tasks 2, 3, and 4 of this Work Assignment are implemented. The disadvantages of implementing Option 1 are that the establishment of cut points for each application would be highly subjective and, likely, highly contentious. In addition, this option would not address the underlying concern that average emissions factors from AP-42 are being used in applications where it might be more appropriate to use a maximum or minimum emissions factor. Furthermore, it is questionable whether the guidance developed in accordance with Option 1 would be implemented by state, local, or tribal agencies.

The following example illustrates the application of Option 1 to determine compliance for CO and NO_x emissions from a small natural gas-fired boiler. Information regarding the emissions factors is presented in Table 5.5. As shown in Table 5.4, an emissions factor would have to be rated B or better to be used for a compliance determination. Therefore, the CO emissions factor could be used for the compliance determination, but the NO_x emissions factor could not be used. An alternate method to estimate NO_x emissions would have to be developed.

TABLE 5.5 OPTION 1 NATURAL GAS SMALL BOILER WITH LOW NO_X BURNERS

Pollutant	Emissions Factor (lb/mmscf)[a]	Emissions Factor Rating[a]	Number of Tests[a]	Factor Acceptable for Compliance Determination (Rated B or Better)
CO	84	B	49	Yes
NO_x	50	D	5	No

[a] Reference 1

5.3.2 Option 2: Arbitrarily Adjust Emissions Factors for Specific Applications

As previously described, there are many instances wherein it would be more appropriate to use a maximum or minimum emissions factor rather than an average emissions factor as currently published in AP-42. However, AP-42 provides limited information regarding the uncertainty or range of values that might be applicable for a given emissions factor. Some examples where uncertainty estimates are provided are in footnotes to Tables 11.1-1, 3, 7 and 10 of Section 11.1 for Hot Mix Asphalt Plants, and on page 2.4-4 of Section 2.4 for Landfills. Under Option 2, an approximate maximum and minimum value for each emissions factor would be estimated by multiplying or dividing the existing (arithmetic mean) emissions factor by a somewhat arbitrary value. For example, the maximum value could be estimated by multiplying the average value by a factor of 3 while the minimum value could be estimated by dividing the average value by a factor of 2. Guidance would be developed regarding the appropriate (average, maximum, or minimum) emissions factor to use for a given application. If a user was unsatisfied with the use of the maximum or minimum value for a given application, the guidance would suggest that alternate means (e.g., conducting a source test or obtaining an emissions factor from source tests of a very similar facility) be employed to better quantify the emissions.

For each of the existing AP-42 emissions factor applications identified in Table 5.1, suggested guidance regarding the use of the average, maximum, or minimum emissions factor is presented in Table 5.4. The guidance presented in Table 5.4 should be viewed as preliminary only and would require extensive review by EPA; state, local, and tribal agencies; and industry prior to adoption.

The advantages to implementing Option 2 are the same as for Option 1; that is, the option is very simplistic and could be implemented regardless of whether the options described in Tasks 2, 3, and 4 of this Work Assignment are implemented. Furthermore, Option 2 addresses the use of an average emissions factor in applications where it might be more appropriate to use a maximum or minimum emissions factor. The disadvantages of implementing Option 2 are that the establishment of arbitrary factors for the estimation of maximum and minimum emissions factors would be subjective and, likely, contentious.

The following example illustrates the application of Option 2 to a compliance determination for CO and NO_x emissions from a small natural gas-fired boiler. Information regarding the emissions factors is presented in Table 5.6. As shown in Table 5.4, a maximum emissions factor would be used for a compliance determination. For this option, it has been assumed that EPA has arbitrarily defined the maximum as three times the average emissions factor. Therefore, the CO and NO_x emissions factors would be adjusted so that they could be used for a compliance determination. However if the user did not like the new emissions factors, then they would need to find an alternate method to estimate emissions.

TABLE 5.6 OPTION 2 NATURAL GAS SMALL BOILER WITH LOW NO_x BURNERS

Pollutant	Emissions Factor (lb/mmscf)[a]	Emissions Factor Rating[a]	Number of Tests[a]	Factor Acceptable for Compliance Determination (3 times the Emissions Factor)
CO	84	B	49	252
NO_x	50	D	5	150

[a] Reference 1

5.3.3 Option 3: Adjust Emissions Factors for Specific Applications Using Statistical Data

Option 3 is similar in nature to Option 2. However, rather than using somewhat arbitrary means to estimate maximum and minimum emissions factor values, upper and lower emissions factor values would be established using statistical techniques. For example, the upper and lower bounds would be established based upon an emissions factor's standard deviation, relative standard deviation (i.e., a sample's standard deviation divided by its arithmetic mean), or variance. Such methods would recommend a confidence interval (e.g., 90 percent, 95 percent, or 99 percent) that would be dependent on the intended use of the factor. As with Option 2, if a user was unsatisfied with the use of the upper or lower value for a given application, the guidance would suggest that alternate means be employed to estimate the emissions.

For each of the existing AP-42 emissions factor applications identified in Table 5.1, suggested guidance regarding the use of the average, upper, or lower value emissions factor is presented in Table 5.4. Again, the suggested guidance presented in Table 5.4 should be viewed as preliminary only and would require extensive review by EPA; state, local, and tribal agencies; and industry prior to adoption.

The advantage to implementing Option 3 is that it addresses the use of an average emissions factor in applications where it might be more appropriate to use a maximum or minimum emissions factor. In addition, Option 3 addresses many of the concerns raised by Option 2 regarding the arbitrariness of the development of the upper and lower bounds for each emissions factor. The disadvantage of implementing Option 3 is that in order to provide the statistical data necessary to define the upper and lower bounds, it would be necessary to implement the options described in Tasks 2, 3, and 4 of this Work Assignment. Implementing these options may require a large capital investment and significant effort. A second disadvantage associated with Option 3 is that the development of a confidence interval to define the upper and lower bounds would be somewhat subjective. To ensure the process is more objective, the same confidence interval would need to applied to the emissions factors by the various users.

The following example illustrates the application of Option 3 to a compliance determination for CO and NO_x emissions from a natural gas boiler. Information regarding the emissions factors is presented in Table 5.7. As shown in Table 5.4, a maximum emissions factor must be established to be used for a compliance determination. For this option, it has been assumed that EPA has defined the maximum as the 95% confidence interval which is within 1.96

standard deviations of the average emissions factor. Therefore, the modified CO emissions factor is calculated according to the following equation.

(84 lb/mmscf) + (104 lb/mmscf) x 1.96 = 288 lb/mmscf

TABLE 5.7 OPTION 3 NATURAL GAS SMALL BOILER WITH LOW NO_X BURNERS

Pollutant	Emissions Factor (lb/mmscf)[a]	Emissions Factor Rating[a]	Number of Tests[a]	Relative Standard Deviation[a]	Standard Deviation	Factor Acceptable for Compliance Determination (95% Confidence Interval)
CO	84	B	49	124%	104	288
NO_x	50	D	5	54%	27	103

[a] Reference 1

5.4 References

1. *Emission Factor Documentation for Compilation of air Pollutant Emission factors, Volume I: Stationary Point and Area Sources, Fifth Edition, AP-42, Section 1.4, Natural Gas Combustion,* U.S. Environmental Protection Agency, Office of Air Quality Planing and Standards. Research Triangle Park, NC, March 1998.